

Inglechina virginiae sp. n. (Nematoda: Seuratidae) from *Sminthopsis virginiae* (Marsupialia: Dasyuridae) from Northern Australia

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ABSTRACT: *Inglechina virginiae* sp. n. (Nematoda: Seuratidae: Echinonematinae) is described from specimens collected from the small intestine of the red cheeked dunnart *Sminthopsis virginiae* (Marsupialia: Dasyuridae) from the Kimberley region and the Northern Territory, Australia. This parasite was found also in the northern brown bandicoot *Isodon macrourus* (Marsupialia: Peramelidae) from the Northern Territory. *Inglechina virginiae* is allocated to *Inglechina* because it has 3 rows of cephalic hooks but no body hooks on the esophageal region of the cuticle. It is distinguished from its congener, *I. australis*, in having the second row of cephalic hooks longer than the first, denticles surrounding the mouth opening, a more extensive region of cuticular bosses on the male tail, shorter spicules, and 4 pairs of caudal papillae on the tail tip. The fourth stage larva of *I. virginiae* can be distinguished from fourth stage larvae of *Linstowinema*, the other genus in the Echinonematinae in which the adults have 3 rows of cephalic hooks, in having 2 rather than 3 rows of cephalic hooks.

KEY WORDS: Nematoda, Seuratidae, Echinonematinae, *Inglechina*, marsupial, dasyurid, Australia.

The Echinonematinae, a subfamily endemic to Australia, has been allocated to the Seuratidae (Spirurida) because of affinities with *Seuratium* species (Quentin, 1971; Chabaud et al., 1980). Derived from ancestors close to parasites of bats, the 3 known echinonematine genera have evolved characteristic arrays of body hooks and spines (Chabaud et al., 1980). The type genus *Linstowinema*, containing 8 species (Smales, 1997), has 3 rows of cephalic hooks and up to 18 rows of anterior body hooks; the remainder of the body surface is covered with numerous rows of spines. The monotypic genus *Seurechina* has no cephalic or body hooks but is covered in spines.

As presently constituted, the third genus, *Inglechina*, erected by Chabaud et al. (1980) for forms with cephalic hooks and body spines but no anterior body hooks, is monospecific. *Inglechina australis* (Inglis and Mawson, 1967) was described as *Echinonema australis* from the dasyurid marsupial, the fat-tailed dunnart, *Sminthopsis crassicaudata* (Gould, 1844).

The echinonematine genera occur only in peramelid and dasyurid marsupial hosts. The dasyurids are small carnivores exhibiting an array of primitive morphological characteristics (Morton et al., 1989), and the peramelids (bandicoots) are opportunistic omnivores with a mix of primitive and specialized features (Gordon and Hul-

bert, 1989). These 2 families are thought to be closely related, and members of both groups readily include arthropods in their diets (Gordon and Hulbert, 1989; Morton et al., 1989).

Examination of material dissected from the red cheeked dunnart *Sminthopsis virginiae* (Tarragon, 1847) revealed a new species of *Inglechina* that is described herein. Fourth stage larvae were also found in 1 host, enabling some comment on the differentiation of larvae of *Inglechina* and *Linstowinema*, the other genus within the subfamily Echinonematinae that has cephalic hooks.

Materials and Methods

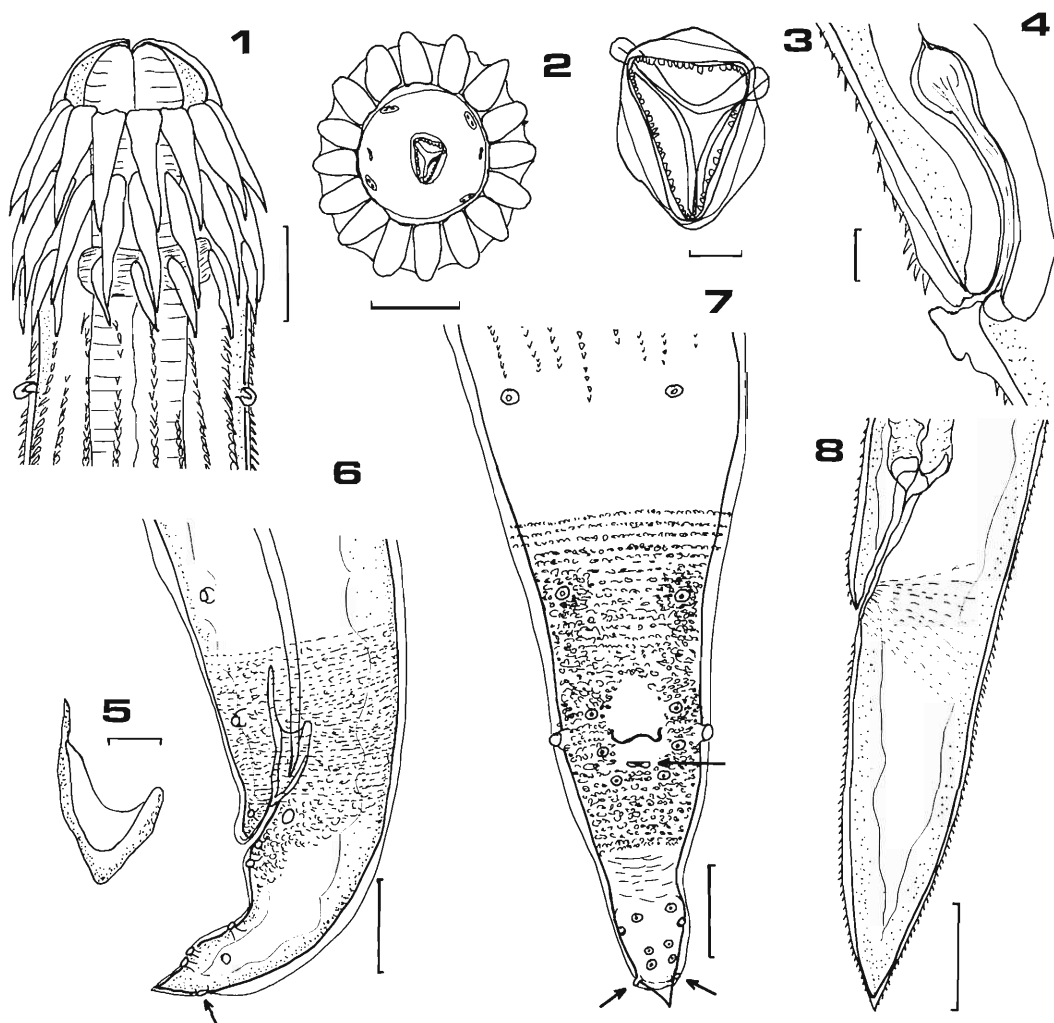
Specimens were dissected from *Sminthopsis virginiae*, fixed in hot 10% formalin, stored at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Wildlife and Ecology collection, Canberra, in 70% ethanol, and examined after clearing in lactophenol. Measurements are given as range (mean) and were made with the aid of an ocular micrometer or drawing tube and map measurer. Drawings were made with the aid of a drawing tube.

Description

Inglechina virginiae sp. n. (Figs. 1–8)

GENERAL: Small worms, anterior end with cephalic bulb bearing 3 rows of hooks, each row containing 14 (male) or 16 (female) large hooks, second row longest, third row shortest (Fig. 1). Mouth opening triangular in outline, with den-

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Figures 1–8. *Inglechina virginiae* sp. n. from *Sminthopsis virginiae* from northern Australia. 1. Anterior end, dorsal view. Bar = 160 μ m. 2. Anterior end, en face view. Bar = 160 μ m. 3. Mouth, en face view showing denticles. Bar = 10 μ m. 4. Vagina, lateral view. Bar = 25 μ m. 5. Gubernaculum, ventral view. Bar = 50 μ m. 6. Male posterior end, left lateral view. Bar = 160 μ m. 7. Male posterior end, ventral view. Bar = 160 μ m. 8. Female posterior end, lateral view. Bars = 100 μ m. Arrows indicate cuticular projections posterior to cloacal opening and position of phasmids.

ticles, without lips or liplike structures. Four double submedian cephalic papillae, 1 pair amphids (Figs. 2, 3). Remainder of body with numerous rows of spines extending posteriorly; number of rows of spines increasing progressively to 29 (male) or 34 (female) at midbody, decreasing posteriorly, extending over 70% of body surface dorsally, almost reaching anterior pair of caudal papillae ventrally (male) or extending over entire body (female). Esophagus simple, club shaped, 7–10% body length. Nerve

ring surrounding esophagus within cephalic bulb; excretory pore anterior to deirids, both posterior to cephalic bulb.

MALE (measurements of 10 specimens): Length 3.1–5.3 (4.6) mm, width 145–240 (170) mm. Cephalic bulb 110–150 (135) μ m long by 100–155 (125) μ m wide; cephalic hooks of first row 61–83 (75) μ m, second row 77–100 (86) μ m, third row 50–60 (56) μ m long. Esophagus 500–750 (640) μ m long. Deirids 145–195 (156) μ m, nerve ring 119 μ m ($n = 2$), excretory pore

165 μm ($n = 2$) from anterior end. Spicules equal, similar, without alae, 370–470 (410) μm long, about 10% body length. Gubernaculum subtriangular in ventral view, right edge extended anteriorly (Fig. 5), 60–80 (67) μm ($n = 6$). Ten pairs caudal papillae; 3 pairs ventral and immediately pre-, ad-, and postcloacal, respectively; 1 pair lateral adcloacal, 2 pairs lateral precloacal, all same size; 4 pairs papillae, 1 pair phasmids well posterior to cloaca near tail tip. Cloacal region with small cuticular bosses extending anteriorly beyond level of second pair lateral papillae. Doubled cuticular projection posterior to cloacal opening (Figs. 6, 7). Tail 80–125 (110) μm .

FEMALE (measurements of 9 specimens): Length 7–10 (9) mm, width 100–390 (265) μm . Cephalic bulb 127–182 (161) μm long by 132–168 (157) μm wide; cephalic hooks of first row 68–94 (81) μm , second row 77–109 (97) μm , third row 60–76 (68) μm long. Esophagus 660–1,055 (870) μm long. Deirids 155–235 (203) μm , excretory pore 197–245 μm ($n = 3$); nerve ring 145 μm ($n = 1$) from anterior end. Vulva 2.7–3.9 (3.3) mm from anterior end. Vagina 150 ($n = 2$) μm long, directed anteriorly (Fig. 4). Monodelphic. Tail 495–700 (595) μm long (Fig. 8). Eggs almost spherical 40–50 (45) μm by 36–43 (41) μm .

FOURTH STAGE LARVA (measurements of 10 specimens): Length 1,350–1,800 (1,525) μm , width 74 μm . Cephalic bulb with 2 rows of cephalic hooks, remainder of body with rows of spines extending to tail tip.

TYPE HOST: *Sminthopsis virginiae* (Tarragon, 1847).

TYPE LOCALITY: Mitchell Plateau, Kimberley Region (15°08'S, 125°46'E), Western Australia.

SITE OF INFECTION: Small intestine.

DATE OF COLLECTION: 1982.

ETYMOLOGY: The species name is taken from the species name of the host.

SPECIMENS DEPOSITED: WAM 80-98 (holotype), WAM 81-98 (allotype), WAM 82-98, WAM 53-98, WAM 54-98, WAM 58-98 (14 male, 7 female, 6 fragments of female paratypes) in the West Australian Museum, Perth. AHC 31275, AHC 31276, AHC 31277 (4 male, 2 female, 1 fragment of female paratypes) in the South Australian Museum, Adelaide. N3308, from *S. virginiae* collected from McIlwraith Range, Cape York, Northern Queensland, 13 August 1990 (2 males, 8 females, 10 larvae) and

from *S. virginiae* collected from Coomalie Creek, Northern Territory, 2 August 1992 (1 male, anterior end); N4412 from *Isoodon macrourus* collected from Coomalie Creek, Northern Territory, 1 August 1992 (1 male), in the Wildlife and Ecology collection, CSIRO, Canberra.

REMARKS: *Inglechina virginiae* can be distinguished from *I. australis*, the type and only other species in the genus, in having the second row of cephalic hooks longer than the first rather than the first longer than the second. Although the lengths of the cephalic hooks in each row differ among individuals, the relative length of the 3 rows remains consistent for each worm. The denticles surrounding the mouth opening of *I. virginiae* are not present in *I. australis*. This species can be further distinguished from *I. australis* in having shorter spicules, 370–470 μm compared with 460–520 μm for *I. australis*, 4 pairs of caudal papillae on the tail tip, not 3 as in *I. australis*, the cloacal region not inflated but with more extensive cuticular embossing (Fig. 7; Inglis and Mawson, 1967, p. 174, fig. 4). Both species have a doubled cuticular projection just posterior to the cloacal opening, but only *I. australis* has a single median papillalike structure on the anterior lip of the cloaca.

Discussion

The type species, *I. australis*, occurring in the dasyurid host *Sminthopsis crassicaudata*, has only been reported from Oodnadatta in northern South Australia. *Inglechina virginiae*, occurring in the dasyurid *S. virginiae* and the bandicoot *Isoodon macrourus* (Gould, 1842) by contrast, is reported for the first time from the Northern Territory and northern Western Australia.

The finding of a single male specimen of *Inglechina virginiae* in *Isoodon macrourus* is the only instance of the genus occurring in bandicoots. Given that *I. virginiae* was collected from *S. virginiae* in the same locality, this infection may be accidental. However, *I. virginiae* may normally occur in bandicoots. The Echinonematinae have arthropods as intermediate hosts (Chabaud et al., 1980) and both dasyurids and peramelids (bandicoots) are insectivorous. This feeding behavior could explain the occurrence of *I. virginiae* in both groups. More animals are needed from the region to determine whether bandicoots are accidental or regular hosts for *I. virginiae*.

Two genera in the Echinonematinae, *Inglechina* and *Linstowinema*, have 3 rows of cephalic hooks. The fourth stage larvae of *Linstowinema* also have 3 rows of cephalic hooks (Smales, pers. obs.), but those of *Inglechina* have only 2. In both genera, the larvae have similar body spination, i.e., rows of spinules extending posteriorly from the cephalic bulb to the tail tip. Therefore the number of rows of cephalic hooks can be used to distinguish between the larvae of these 2 species.

Acknowledgments

We thank Professor A. Chaubaud, Dr. D. Spratt, and Dr. P. Presidente for giving us access to specimens.

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